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Nutritional Assessment of Overweight Pregnant Women and its Association with Gestational Diabetes

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Overweight and obesity pose a big challenge to pregnancy as they are associated with adverse maternal and perinatal outcomes, including increased risk of gestational diabetes, pre-eclampsia, stillbirth to childhood obesity and increased vulnerability to non-communicable diseases during adulthood. This study aims to evaluate the nutritional status of overweight pregnant women and their association with gestational diabetes**.** During this cross-sectional study that extended over 9 months, 200 overweight pregnant women were recruited using simple random sampling. Nutritional status was evaluated using a pre-tested, semi-structured questionnaire. Data was collected via face-to-face interviews conducted by a trained dietitian. Data analysis was performed by using SPSS version 26. Among the study population of 200 obese participants, 41% were overweight, and 59% were obese. Even though more than 50% of the study population had sufficient nutrition-related knowledge, including food portion sizes, their dietary habits were poor. Skipping at least one meal per day was reported by 38% of participants, with 70% who had inconsistent breakfast habits. Surprisingly, approximately 45% of participants were suffering from mild or severe anemia. This result indicates that people with overweight can also suffer from hidden hunger. It has also been indicated that 74.5% overweight and obese pregnant women had undesirable weight gain during pregnancy, out of which 14% were diagnosed with gestational diabetes. The main concern in this research was to establish a connection between the poor dietary behaviors of missing meals and failure to eat regularly, with the high chances of getting gestational diabetes mellitus (GDM). The study concluded that most overweight pregnant women have poor nutritional status. They experience complications such as pre-eclampsia, gestational diabetes, and adverse symptoms more frequently. Strong associations have been observed between overweight pregnancies and pre-pregnancy BMI. The study highlights the critical need for targeted nutritional and dietary counseling for obese and overweight to correct their poor dietary habits and reduce the risk of GDM and anemia
Keywords: Pregnancy outcomes, glucose intolerance, maternal overweight, dietary practices.

INTRODUCTION

Overweight is considered a public health problem in both industrialized and developing countries. Out of the 16.7 billion people who are overweight worldwide, 33.3% million are obese women. Maternal obesity incidence has increased by 60% over the last two decades, with nearly one in three women entering pregnancy being obese. The prevalence of this disease is between 20% to over 50%, particularly among impoverished women. This trend is especially worrisome when it comes to pregnancy because it presents special difficulties and has the potential to have a detrimental outcome on both the mother and the fetus (Sheha et al., 2018). This extensive background section aims to present a thorough analysis of the rising rates of overweight and obesity during pregnancy, supported by pertinent research articles, highlighting the underlying causes, related health implications, and potential repercussions for mothers and their developing children (Abrams et al., 2000). It is anticipated that it is estimated that around 366 million individuals across the world will be affected by diabetes. during the next 30 years, necessitating the planning and execution of preventive actions to stop this global issue. Pregnancy is a crucial time to implement appropriate therapies and activities to reduce the risk of developing type 2 diabetes (Kim et al., 2010).

Gestational diabetes mellitus (GDM) is a condition where carbohydrate intolerance leads to high blood sugar levels

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during pregnancy. It affects 1% to 14% of pregnancies and can cause complications for both the mother and the baby. These include difficult delivery, low blood sugar in infants, and an increased likelihood of cesarean section. Although most women with GDM return to normal after delivery, some may continue to have abnormal blood sugar levels. Women who have had GDM are also at a higher risk of developing type 2 diabetes in the future. Being overweight or obese is a common risk factor for both GDM and type 2 diabetes (Kim et al., 2007). Typically, the frequency of type 2 diabetes in the underlying population is reflected in the prevalence of GDM. In the US, Native Americans, Asians, Hispanics, and African American women are more likely to develop GDM than non-Hispanic white women. In Australia, it was GWG discovered that women who were born in China or India had a higher prevalence of GDM than women who were born in Europe or Northern Africa. It has been noted that the percentage of GDM-complicated pregnancies in Asian nations is lower than the percentage seen in Asian women residing on other continents. In India, it has been discovered that women who live in urban regions experience GDM more frequently than women who live in rural areas. Chinese researchers found that women who had excessive GWG had a 32.8% higher risk of acquiring GDM than women who did not have excessive (Ferrara et al., 2007).

The growing fetus and the newborn are directly affected by maternal fat and overweight. It is also found that maternal overweight and obesity were linked to a higher risk of unfavorable delivery outcomes, such as macrosomia, preterm birth, stillbirth, and congenital abnormalities. According to the study's findings, there is also a higher risk of neonatal problems such as hypoglycemia, respiratory distress syndrome, and admission to neonatal critical care units are poor pregnancy outcomes. Up to 5% of women experience postpartum hemorrhage, which is marked by significant blood loss during delivery (Langley-Evans et al., 2022).

The frequency of overweight and obesity during pregnancy is on the rise due to a variety of causes. The availability of highly processed foods, sedentary lifestyles, and restricted access to healthy food options are just a few examples of the sociological changes that have a big impact. Pregnancy-related nutrition and exercise treatments have been reported to minimize the incidence of GDM, and this impact may be related to early lifestyle changes that reduce gestational weight gain before the mid-second trimester (Dolatkhah et al., 2018). The availability of processed meals and sedentary lifestyles, among other societal and environmental factors, have a significant impact on the rising prevalence.

Treatment for gestational diabetes requires a variety of nutritional strategies, among which MNT is the cornerstone. To restore the situation to normal, this entails adjusting calories and nutrients, making sure that blood sugar and carbohydrate levels are appropriate, and avoiding ketosis. The distribution of calories is determined by the optimal body weight, with recommendations varying by kilocalories per kilogram for women who are normal, overweight, or obese. It's important to consider pre-pregnancy weight, BMI, gestational weight increase, and physical activity. A daily calorie intake of macronutrients should consist of 33%–40% complex carbohydrates, 35%–40% fat, and 20% proteins. Exercise helps manage fasting and post-meal hyperglycemia, as well as helps overcome insulin resistance. It can raise blood glucose levels in addition to dietary treatments (Poston et al., 2015).

Vitamin D's involvement in secretion and insulin dysregulation is supported by dietary supplements, which include supplies of macro- and micronutrients. Vitamin Inositol is employed in insulin-susceptible medications and can be found in cereals, maize, legumes, and meat. It has been demonstrated that vitamin D supplementation improves healthy people. Probiotics such as Lactobacillus, Bifidobacterium, and Enterococcus show promise in treating dysbiosis-related intestinal illnesses, and interest in this field has grown. Prebiotics, which are mainly non-digestible oligosaccharides found in food, have been shown in studies to specifically promote microbial growth and activity, mainly impacting species of lactobacillus and bifidobacteria. This also includes determining how accurately pregnant women estimate their own BMI, as well as describing pregnant women's understanding of GWG recommendations, safe, effective weight- management approaches, and awareness of the consequences of obesity and excessive GWG during pregnancy (Langley-Evans et al., 2022).

In Croatia, pregnant women were studied cross-sectionally to establish their pre-pregnancy body mass index and the outcome of their pregnancies. In comparison to women with normal BMI, overweight and obese women had a higher prevalence of induction of labor and cesarean delivery, whereas underweight and obese women had a higher prevalence of premature birth. Preeclampsia, prenatal hypertension, and gestational diabetes (GD) were more prevalent in the overweight and obese group (Guelinckx et al., 2008). A similar study was conducted in Limbe, Cameroon which involved administering a pretested questionnaire to 200 pregnant women aged between 24-28 weeks gestation. A 2-hour oral glucose tolerance test was carried out after fasting overnight. The study also revealed that GDM was associated with advanced maternal age, a BMI of ≥30 kg/m2, a history of unexplained stillbirth, and a history of macrosomia (Lindqvist et al., 2014).

A scientific inquiry was performed to explore the level of awareness about Gestational Diabetes Mellitus (GDM) among 403 pregnant women who were at 30 weeks of pregnancy or more. There was a significant relationship between awareness of GDM and age and educational level. Women over the age of 35 were found to have greater awareness of GDM. However, less educated, or uneducated women were more likely to be unaware of GDM. The study

findings suggest that there is a need to increase awareness about GDM among pregnant women, particularly among younger and less educated or uneducated women (Chivese et al., 2019).

A study was conducted in Northwest Ethiopia to diagnose gestational diabetes mellitus (GDM) using a two-hour 75-gram oral glucose tolerance test as part of a universal one-step screening and diagnostic strategy. The study included 1027 pregnant women who were selected through a systematic random sampling technique. The study found that 12.8% of the pregnant women had GDM. The study also found significant associations between GDM and factors such as overweight and obesity, low physical activity (3.36%), inadequate dietary diversity (1.9%), and antenatal depression (4.12%) (Muche et al., 2019).

A cross-sectional study was conducted on 1276 pregnant women who underwent prenatal examinations and normal singleton deliveries at the Fifth People's Hospital of Shanghai and Hospital of Integrated Chinese and Western Medicine in Minhang District. Out of these, 99 cases were diagnosed with GDM, while 1177 cases were normal. The participants were divided into three groups based on the level of blood Hb measured during the first trimester of pregnancy. 236 cases were classified as having a low Hb level (Hb<110 g/L), 868 cases as having a normal Hb level (110 g/L≤Hb<130 g/L), and 172 cases as having a high Hb level (Hb≥130 g/L) (Gao et al., 2019).

To evaluate the effects on mothers and newborns, involving two groups of pregnant women, one with hyperlipidemia and the other without, was carried out. Preeclampsia, cholestasis, gestational diabetes mellitus, mother's age, body mass index, weight gain throughout pregnancy, and delivery technique are among the maternal data. As with other neonatal outcomes, birth weight and Apgar score were recorded. The findings demonstrated that when gestational age grew, so did the prevalence of aberrant lipid markers. The incidence rates of gestational diabetes, preeclampsia, cholestasis, fetal growth retardation, and macrosomia were statistically higher in pregnant women with dyslipidemia in combination with increased triglyceride, cholesterol, and Low-density lipoprotein and decreased High-density lipoprotein (Sharami et al., 2019).

A cross-sectional study was conducted to investigate the link between maternal age, pre-pregnancy body mass index (BMI), gestational weight gain (GWG), and poor consequences associated with elevated HbA1c levels in women with GDM. The study included 650 women with GDM and singleton live births. Logistic regression was used to assess the relationship between HbA1c and unfavorable pregnancy outcomes. The results showed that HbA1c levels had a strong association with preterm birth, primary Caesarean section (in GDM women with HbA1c < 5.0%), macrosomia, and pregnancy-induced hypertension compared to women with HbA1c levels below these values (Muhuza et al., 2023). Between 2012 and 2013, a cross-sectional study was carried out on 256 pregnant women who were referred to two university hospitals (Shariati and Arash Hospitals) for prenatal treatment in the third trimester of their pregnancy. These women had gestational diabetes. During each trimester, measurement of body weight and fasting plasma glucose was done, and BMI was calculated. The study noted the prevalence of GDM and compared the BMI of the women with GDM with that of those without GDM. The average age of the women was 28.70 ± 5.57 years. Out of the 256 women, 78 (30.5 %) had GDM, of which 21 (52.5 %) were obese, 25 (27.2 %) were overweight, and 32 (25.4 %) had normal weight (p = 0.004). The study identified three independent predictors of GDM, which were maternal age above thirty years, family history of diabetes, and pre-pregnancy adiposity (Pirjani et al., 2017).

This study underscores the growing public health importance of addressing overweight and obesity during pregnancy, which pose significant risks to both maternal and fetal health. By examining how factors such as age and nutritional awareness influence these outcomes, the research highlights critical gaps that must be addressed to prevent gestational complications. Understanding the underlying causes and health implications is essential for developing effective, evidence-based strategies. Nutritional management remains the cornerstone of gestational diabetes prevention and care, with dietary modifications, targeted supplementation, and lifestyle changes offering promising avenues to lower risk. Hence, the current investigation aims to determine the prevalence of gestational diabetes in overweight and obese pregnant women along with its association with their food habits. It is necessary to introduce the relevance of food habits and behaviors to enhance the dietary findings. Missing meals is of great importance in the conditions of gestational diabetes mellitus (GDM) as it may result in bigger post-meal excursion of glucose, insulin resistance, and increased metabolic stress. These variations lead to a high risk of glucose intolerance in pregnancy. Thus, emphasizing the fact that irregular eating patterns and breakfast skipping in particular contribute to the increased risk of GDM can be a more concrete way of connecting the described eating patterns and the results of the research. Collaborative efforts among healthcare providers, policymakers, and communities are vital to implement these interventions effectively. Moreover, advancing clinical research in this area will help refine prevention strategies, enhance prenatal care, and reduce both immediate and long-term health consequences for mothers and their children. Ultimately, this study contributes to the broader goal of safeguarding maternal and fetal well-being and promoting healthier future generations.

Although the link between obesity and GDM is well established but studies are being conducted to find the role of poor dietary habits and its role in the development of anemia and GDM in obese and overweight pregnant women.

MATERIALS AND METHODS

***Study Design*:** This was a hospital-based Cross-Sectional Study of overweight pregnant women at different government hospitals in Lahore.

***Sample Size*:** The sample size was 200 overweight pregnant women. The population of the study is overweight pregnant women (3rd trimester). The hospitals were selected based on accessibility, and the participants were determined using a convenient sampling technique.

***Sampling Technique*:** A convenient sampling technique was used to select the hospitals and study participants. The hospitals were selected based on accessibility and the participants were selected based on their eligibility criteria.

***Study Setting*:** First, an ethical approval letter was obtained from the ethical review committee of Riphah International University. The study was conducted at Jinnah Hospital and Ittefaq Hospital in Lahore. Verbal and written consent was obtained from each participant.

***Duration*:** The study was completed in 6 months after the approval of the synopsis from the Board of Advanced Studies and Research (BASR).

***Data Collection Tools*:** The study will use the following tools for overweight pregnant women.

- Food Frequency Questionnaire (FFQ)
- 24 hours dietary recall
- Hemoglobin level test (Hb)
- Oral glucose tolerance test (OGTT)

***Food Frequency Questionnaire (FFQ)*:** This questionnaire was used to collect information about the overweight pregnant women, their socio-demographic features, obstetric characterizes, their meal habits and behavior, nutrition related knowledge. Basically, the survey is design to access dietary habits and physical activity of overweight pregnant women (Chivese et al., 2019).

***24 hours dietary recall*:** A 24-hour nutritional memory was used to collect information about the overweight pregnant women dietary consumptions. This recall provides information about the types and quantities of food expanded by overweight pregnant women over 24 hours (Muche et al., 2019).

***Hemoglobin level test (Hb)*:** Hb blood test measures red blood cell hemoglobin levels, with a normal range of 12-14 grammes. If anemia is less than 10 grams, treatment is offered. Normal values vary during pregnancy, with the lowest being 11 grams. This test provides information about the overweight pregnant women (do Nascimento et al., 2019).

***Oral glucose tolerance test (OGTT)*:** Pregnancy care providers use glucose screenings to detect gestational diabetes, which is diagnosed through blood sugar values below 140 mg/dL, followed by a three-hour glucose tolerance test if blood sugar exceeds 135mg/dL. This test provides information about the glycemic control of overweight pregnant women (Liu et al., 2015).

***Data Collection Procedure*:** The cross-sectional study's data collection procedure was conducted in two selected hospitals, namely Jinnah Hospital and Ittefaq Hospital, both of which have established OPD facilities. The primary focus of this process was to identify potential participants who met the inclusion criteria, particularly overweight pregnant women. The eligible participants were approached and informed about the study, including its objectives, resolution, and eligibility criteria. During the data collection process, the collection tools mentioned earlier were used, and participants were placed in a private and confidential setting to ensure their privacy. The researchers also took the necessary steps to explain the study's objectives and the presence and elimination criteria to the participants. This approach was adopted to guarantee that the participants had a comprehensive understanding of the study and could provide accurate and reliable data.

***Data Analysis Procedure*:** The analysis was conducted utilizing the Statistical Package for the Social Sciences software (SPSS version 26.0).

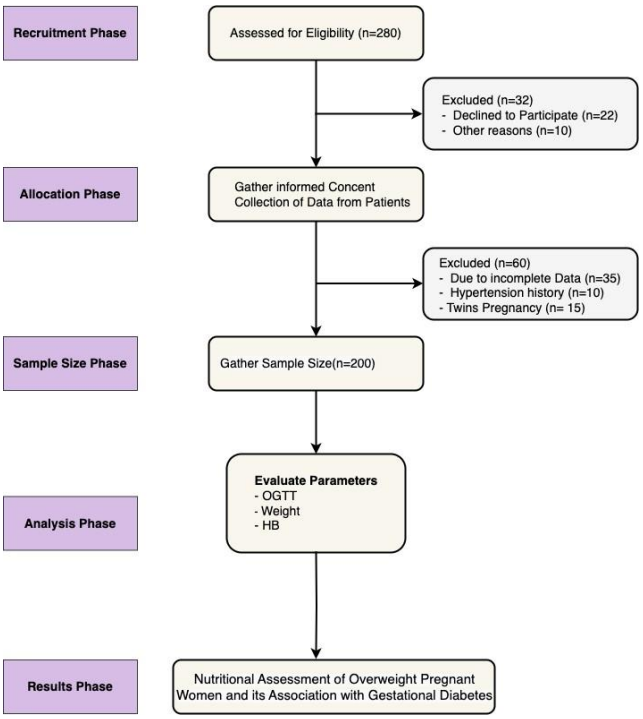

Figure 1. Study flow diagram of overweight pregnant women and their association with gestational diabetes.

Gestational weight gain guidelines (Institute of Medicine, 2019) (55).

Pre-pregnancy BMI	Total weight gain at term	Rate of weight gain in the 2nd and 3rd trimester; Mean (range)
Underweight (<18.5 kg/m^2)	12.5–18 kg 28–40 lbs.	0.51 (0.44–0.58) kg/week 1 (1–1.3) lbs./week
Normal weight (18.5–24.9 kg/m^2)	11.5–16 kg 25–35 lbs.	0.42 (0.35–0.50) kg/week 1 (0.8–1) lbs./week
Overweight (25.0–29.9 kg/m^2)	7–11.5 kg 15–25 lbs.	0.28 (0.23–0.33) kg/week 0.6 (0.5–0.7) lbs./week
Obese (≥ 30.0 kg/m^2)	5–9 kg 11–20 lbs.	0.22 (0.17–0.27) kg/week 0.5 (0.4–0.6) lbs./week

RESULTS

Nutrition assessment of the study population revealed that out of the 200 respondents, a significant proportion of 82 (41%) pregnant women were classified as overweight and 118 (59%) pregnant women were classified as obese. The mean age of study participants was 27 years. Among these (32%) were working ladies. Most of the study population (44.5%) attended college or university. Only (6.5%) of study participants were illiterate. Most of the study population was either from lower class (43.5%) or middle class (45.5%).

Table 1. Socio - demographic characteristics of participants.

Age (years)	27± 4.6	
	n = frequency	**Percent**
Occupation		
Housewife	136	68.0%
Labor worker	19	9.5%
Government employer	45	22.5%
Education Level		
Not attended school	13	6.5%
Primary school	26	13.0%
Secondary school	72	36.0%
College and above	89	44.5%
Family size		
More than 5	130	65.0%
Less than 5	70	35.0%
Socioeconomic status		
Lower class	87	43.5%
Middle class	91	45.5%
Upper class	22	11.0%
Family history of Diabetes	98	49.0%
Food Allergy	73	36.5%

The results reveled that the number of multiparous pregnancies was 152 (76%), 177(88.5%) had gained gestational weight more than recommended range, approximately 149 (74.5%) participants rated their health level more than 5 on Likert scale.

Table 2. Obstetric Characteristics of the Study Participants.

Variable	n = frequency	Percent
Number of pregnancies		
Primiparous	48	24%
Multiparous	152	76%
Gestational weight gain		
Undesirable	177	88.5%
Desirable	23	11.5%
Health Perception		
Good to Excellent	149	74.5%
Poor	51	25.5%
Inter-pregnancy interval		
< 2years	74	37.0%
≥ 2 years	126	63.0%

Table 3. Meal Habits of the study participants.

Variable	n = frequency	Percent
Meals per day		
More than 3	158	79.0%
Less than 3	42	21.0%
Intake of water per day		
12-14 glasses	52	26.0%
9-12 glasses	95	47.5%
Less than 8 glasses	53	26.5%
Fruits and vegetable per day		
1-2 serving	46	23.0%
2-3 serving	107	53.5%
4-5 serving	47	23.5%
Intake of Fish		
Once every 2 months	112	56.0%
Once in a month	15	7.5%
Sparingly	73	36.5%
Intake of Poultry and Eggs		
On daily basis	59	31.0%
Once in a week	99	49.5%
Often	42	21.0%
Intake of milk per day		
More than once	99	49.0%
None	101	50.0%
Breakfast per week		
Daily	61	30.5%
Often	122	61.0%
None	17	8.5%
Skipping one meal per day		
Never	138	65.0%
Seldom	53	33.5%
Always	9	4.5%

Approximately (158)79% reported that they are consuming 3 or more than 3 meals per day, 53(26.5%) of participants had inadequate water intake per day. Fruits and vegetables

consumption indicate that 46 (23%) participants were consuming less than recommended number of fruits and vegetables. Consumption of fish was very low; however, they were consuming poultry and egg frequently. Approximately 99 (49%) participants were consuming milk at least more than once per day. Skipping meals at least once was common among 53 (33.5%) participants. In consistent breakfast habits were observed 122 (61%) participants often had breakfast, however (4.5%) participants used to regularly skip breakfast.

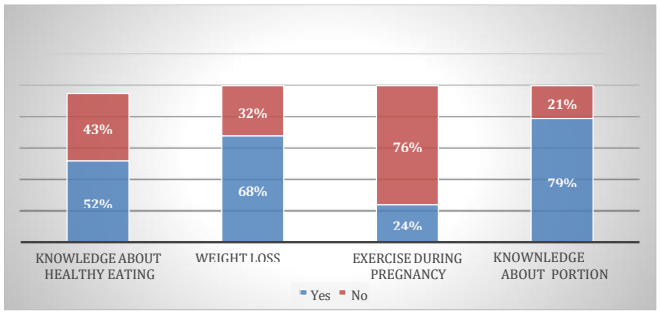

Figure 2. Knowledge, Attitude and Practices related to nutrition among overweight pregnant women.

The results revealed that 104 (52%) overweight pregnant women had nutrition knowledge and 136 (68%) have knowledge and followed weight loss diet over their life span. Only 48 (24%) Overweight pregnant women were exercise during pregnancy regular but majority 158 (79%) overweight pregnant women have knowledge about portion size of foods.

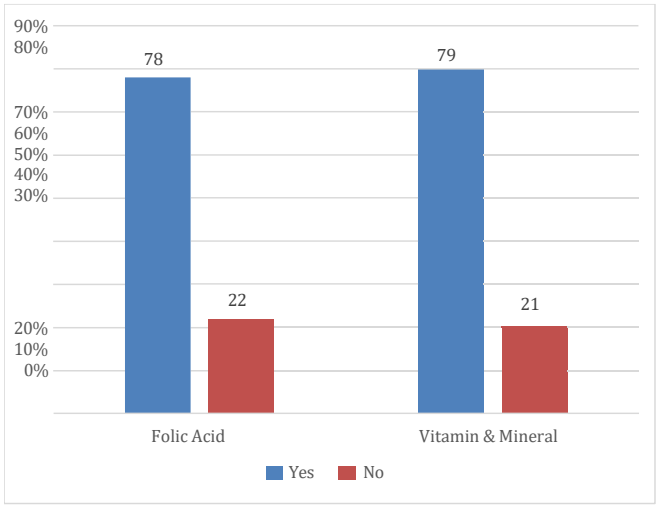

Figure 3. Frequency of supplement consumption among overweight pregnant women.

Majority of the study participants showed compliance with prescribed supplements such as 156 (78%) overweight pregnant women were consuming folic acid regularly. and 158 (79%) overweight pregnant women were consuming vitamin and minerals regularly. however, 42 (21%) were not taking their prescribed supplement regularly.

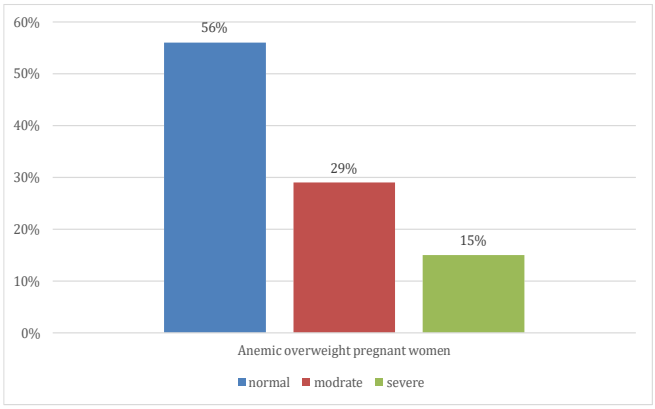

Figure 4. Prevalence of anemia among overweight pregnant women.

According to the WHO, the recommended range of hemoglobin level for pregnant women should be 12-16 g/dl. And its minimum values 11-10.5g/dl. Our data indicated that approximately half of the study participants 58 (29%) were either suffering from moderate anemia or 30 (15%) were suffering from severe anemia. Their poor nutritional status and unfavorable blood profile are indicated by this.

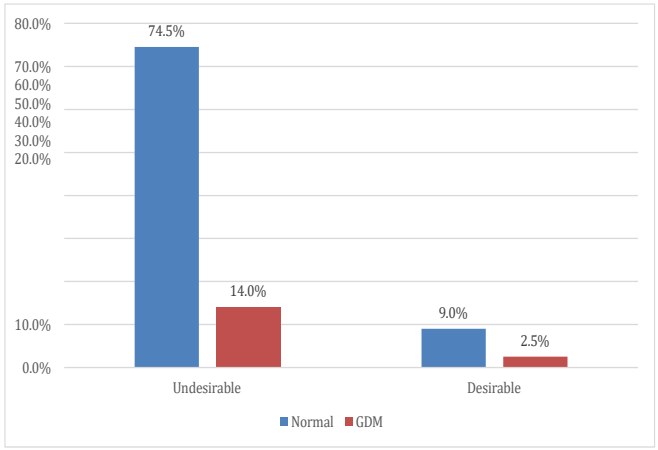

Figure 5. Prevalence of gestational diabetes in overweight and obese pregnant women.

According to the IOM guidelines, recommended weight gain had been desired 18.4 to 24.9 kgs for women of normal weight and overweight pregnant women 25 to 29.9 kgs. The result of the study participants showed that 148 (74.5%) overweight and obese pregnant women had undesirable weight gain during pregnancy out of which 28 (14%) had suffering from gestational diabetes, and 18(9%) overweight pregnant women had desirables weight out of which 5(2.5%) had gestational diabetes.

Table 4. Pregnancy complications of the study participants.

Variable	n = frequency	Percent
Complications		
Spotting	30	15%
Nausea	34	17%
Eclampsia	21	10.5%
Vomiting	35	17.5%
Heart burn	41	20.5%
Constipation	39	19.5%
Overweight health risk		
Anemia	48	24%
Difficult delivery	76	38%
General weakness	68	34%

Complication associated with pregnancy and health risk associated with being overweight during pregnancy were more prevalent among the study population. 30 (15%) of the participants had spotting, 34(17%) had nausea and vomiting, 21(10.5%) had eclampsia, and 39 (19.5%) had constipation. More than 48 (24%) were having general weakness and 76 (38%) had complications had associated with delivery.

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DISCUSSION

Gestational diabetes mellitus (GDM) is a condition characterized by glucose intolerance that begins or is first diagnosed during pregnancy. However, this definition has limitations as many cases of GDM may have pre-existing hyperglycemia. Therefore, women who are diagnosed with diabetes using diagnostic criteria other than pregnancy are not included in the most recent definition of GDM (Sheha et al., 2018). The prevalence of GDM varies from 7.5% to 27.0% in different regions, mainly based on racial differences and diagnostic standards. GDM can have negative effects on both the mother and the offspring, such as pre-eclampsia, dystocia, cesarean sections, postpartum hemorrhage, and the eventual development of type 2 diabetes mellitus (Abrams et al., 2000). GDM (Gestational Diabetes Mellitus) leads to serious health problems for both the mother and the baby. It can cause macrosomia (abnormally large babies), childhood obesity, metabolic syndrome, and cardiovascular diseases in the offspring (Kim et al., 2010). Overweight and obesity are the main risk factors for developing GDM. Unfortunately, the number of overweight and obese women of reproductive age has been increasing significantly in recent decades. It is estimated that overweight and obese pregnant women are more than twice as likely to develop GDM compared to non-obese women. Moreover, if a pregnant woman is both overweight/obese and has GDM, the risk of adverse outcomes increases even further (Ferrara, 2007).

The Institute of Medicine has provided recommended guidelines for the ideal gestational weight gain (GWG) for pregnant women. According to these guidelines, the total GWG should be within a certain range depending on the pre-pregnancy body mass index (BMI). For underweight women, the recommended range is 12.5–18 kg, for normal-weight women it is 11.5–16 kg, for overweight women it is 7–11.5 kg, and for obese women it is 5–9 kg. It is important to avoid excessive GWG as it increases the risk of various pregnancy complications such as gestational diabetes, hypertensive disorders, large for gestational-age infants, macrosomia, cesarean delivery, postpartum weight retention, and obesity in offspring (Charnley et al., 2021).

The study population consisted of 200 participants, among which 41% of pregnant women were found to be overweight and 59% were classified as obese based on the nutrition assessment. The average age of the participants was 27 years old, with 32% of them being working women. A significant proportion of the study population was highly educated, with 44.5% attending college or university, while only 6.5% were illiterate. Furthermore, most of the participants belonged to the lower class (43.5%) or middle class (45.5%). Upon taking their medical history, it was discovered that 48% of them had a family history of diabetes, and 36.5% had some form of food allergy. The results of this study shed light on the alarming prevalence of maternal obesity and excessive gestational weight gain in the region, which emphasizes the need for targeted educational campaigns and intervention programs in clinical settings (Dolatkhah et al., 2018).

The study participants' obstetric characteristics were analyzed, and the results indicated that most of them, precisely 152 out of 200, had experienced more than one pregnancy. Furthermore, 177 participants, that is 88.5% of the total, had gained weight beyond the recommended range during their gestational period. In terms of the health level, around 149 participants, accounting for 74.5% of the total rated their health level above 5 on a Likert scale. Lastly, it was observed that 126 pregnancies, which is 63% of the total, had intervals of more than 2 years.

The literature has consistently shown that a higher risk of GDM is associated with higher maternal BMIs (53). Chu et al. discovered that a rise in pre-pregnancy BMI significantly increased the incidence of GDM (54). According to their findings, the unadjusted risk of getting GDM was 2.14 for overweight women, 3.56 for obese women, and 8.56 for extremely obese women compared to women of normal weight. Furthermore, a dose-response association between rising BMI and type 2 diabetes has been reported in the general population, even in the normal BMI range, which is consistent with our findings (Zhang et al., 2014).

According to the study conducted, around 79% of the participants reported consuming at least three meals per day. However, around 26.5% of participants had inadequate water intake, which could lead to dehydration. The study also found that 23% of participants consumed less than the recommended number of fruits and vegetables. The consumption of fish was found to be very low, although they

frequently consumed poultry and eggs. Around 49% of participants consumed milk at least once a day. The study also revealed that 33.5% of participants skipped meals at least once, and only 61% of participants consistently had breakfast, while 4.5% used to regularly skip breakfast.

Overweight pregnant women drawn from a high-risk group, eating fruits, vegetables, and cereals seemed to raise the chance of being diagnosed with gestational diabetes mellitus. On the other hand, an increased risk of developing GDM during pregnancy was linked to frequent tea use. In addition to having a low glycemic index, fruits, vegetables, and cereals are well-known sources of fiber and have been demonstrated in our study to be protective against GDM. Numerous theories have been put out to explain why improving glucose metabolism with a high-fiber diet is possible. Reduced absorption of glucose occurs when there is a high fiber content in the stomach, which delays gastric emptying and slows down digestion overall. Furthermore, a diet rich in fiber has been connected to decreased appetite (Lindqvist et al., 2014).

Meal habits of study participants on dietary habits revealed some interesting findings. According to the study, an estimated 67% of the participants consumed milk at least once a day, indicating its popularity as a beverage choice. However, the study also highlighted some concerning trends. Approximately 33.5% of the participants admitted to skipping meals at least once, which is a cause for concern as it can lead to nutritional deficiencies and unhealthy weight loss. Additionally, only 61% of the participants consistently had breakfast, while 4.5% of them used to regularly skip breakfast, which is the most important meal of the day. These findings suggest that many individuals may not be following a healthy and balanced diet, which can have long-term repercussions on their health and well-being.

The study also looked at the impact of diet on pregnant women from a high-risk group and found that overweight women who consumed more fruits, vegetables, and cereals were at a higher risk of being diagnosed with gestational diabetes mellitus. This highlights the importance of seeking professional medical advice and guidance when it comes to diet and nutrition during pregnancy (do Nascimento et al., 2019).

A healthy diet that is balanced in terms of macro- and micronutrients is thought to be crucial for both the mother and the developing child during pregnancy. A balanced diet may help ensure the best possible growth for the fetus, reduce the risk of adverse obstetrical and neonatal outcomes, and have long-term effects on the health of the mother and child (Brandão et al., 2020). Notably, recent studies have revealed that a high-calorie diet may help increase a pregnant person's immunological response and enhance their immune system. On the other hand, malnourished mothers, whether they are under- overnourished, have been associated with aberrant fetal growth patterns, such as small or large fetuses for their gestational age, and with an increased long-term risk of obesity and cardiovascular disease (Yuan et al., 2023).

The primary aim of the study was to examine the frequency of supplement consumption among overweight pregnant women and to gather information on their adherence to the recommended supplement regimen. The results indicated that most of the participant's prescribed supplements were adhering to the regimen, with 156 (78%) overweight pregnant women taking folic acid regularly and 158 (79%) overweight pregnant women consuming the suggested vitamins and minerals. However, the study left incomplete information on the supplement intake frequency of the remaining participants, which could have provided more comprehensive insights into their supplement adherence levels.

Prevalence of gestational diabetes in overweight and obese pregnant women According to the IOM guidelines, recommended weight gain had been desired 18.4 to 24.9 kgs for women of normal weight and overweight pregnant women 25 to 29.9 kgs. The result of the study participants showed that 148 (74.5%) overweight and obese pregnant women had undesirable weight gain during pregnancy out of which 28 (14%) had suffering from gestational diabetes, and 18(9%) overweight pregnant women had desirables weight out of which 5(2.5%) had gestational diabetes.

Complication associated with pregnancy and health risk associated with being overweight during pregnancy were more prevalent among the study population. 30 (15%) of the participants had spotting, 34(17%) had nausea and vomiting, 21(10.5%) had eclampsia, and 39 (19.5%) had constipation. More than 48 (24%) were having general weakness and 76 (38%) had complications had associated with delivery.

Numerous earlier research investigations have investigated preterm birth risk factors. For instance, Liu et al. found that those with high GWG had a higher risk of premature delivery. According to Huang et al., pregnant women in general were more likely to give birth prematurely if their GWG was both excessive and insufficient (Liu et al., 2015). In the current investigation, women with GDM had a greater rate of insufficient GWG (29.6%) than was previously reported for pregnant women in general (12.5%) (Lawrence et al., 2008). These results imply that patient education is desperately needed to prevent too restrictive diet and exercise regimens and to guarantee that pregnant women with GDM gain a fair amount of weight (Byakwaga et al., 2021).

Pregnancy-related hypertension can be avoided and excessive weight gain during pregnancy can be decreased with the help of dietary changes, according to studies. A healthy diet during pregnancy is thought to include foods high in monounsaturated fats, legumes, fruits, vegetables, whole grains, nuts, and seafood. The significance of consuming fatty acids when expecting Consuming mono- and unsaturated fatty acids from olive oil and pistachios may lower the risk of GDM, according to a paper published in J. Clin. Med. in 2021 (Tobias et al., 2012).

Obesity and maternal GDM may represent a spectrum of metabolic dysregulation in mothers because they share numerous metabolic abnormalities. Obesity and gestational diabetes increase the mother's chance of developing the "metabolic syndrome of pregnancy," which raises the risk of lipid, coagulation, and hypertension problems and increases the morbidity and mortality of the fetus (Muir et al., 2020). These women's children are also more likely to experience long-term consequences from an aberrant in-utero metabolic environment, as well as neonatal morbidity. Reducing the risk of these issues can best be achieved by changing one's lifestyle to include a normal weight before conception through nutrition and exercise (Liu et al., 2015). Nonetheless, as recently highlighted in the updated IOM guidelines, attaining acceptable weight growth during pregnancy and avoiding excessive gestational weight gain may lower perinatal morbidities like maternal weight retention and, consequently, reduce pregravid weight in subsequent pregnancies. There is a chance to enhance a woman's and her child's short- and long-term health during the perinatal period. Optimal treatment for women before and during pregnancy is essential for their health and well-being if the aim is to prevent chronic metabolic disease rather than treat it (Escribè-Agüir et al., 2008).

***Conclusion*:** Gestational diabetes mellitus is a common consequence of pregnancy that is emerging as a significant global health concern. Excessive gestational weight gain (GWG) is among the few modifiable risk factors for unfavorable perinatal outcomes, and its aberrations can adversely affect the short- and long-term health of both the mother and her offspring. In our study, we also investigated the relationship between dietary practices and the risk of gestational diabetes mellitus (GDM). We examined various food categories such as sweets, rice, pasta, bread and crackers, potatoes, lentils, and juices. However, we found no correlation between the diagnosis of GDM and any of these food categories. Although we observed that consuming cereals, fruits, and vegetables seemed to offer some protection against GDM. On the other hand, frequent tea consumption was associated with an increased chance of developing GDM.

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